Knowledge and technology transfer at university
Case study for University of Žilina and the Žilina region in Slovakia

1. Introduction

The knowledge society, knowledge economy, knowledge firm are magic words in a lot of speeches. The knowledge society is presented as a large concept based on science, research and development. It also includes a lot of economic aspects, because the knowledge is centre and driver of added value from high tech industries and ICT through services based on knowledge and creativity. The features of the knowledge firm product include creativity, non-standard realization, complexity, flexibility and are personalized. For the production processes the firm has to use codified and tacit knowledge and in the processes the firm creates, uses and shares knowledge. Creation of knowledge represents process the new ideas formatting through interaction codified and tacit knowledge. Question is why the firms do not react similarly on the new knowledge and what are the ways for diffusion of knowledge and innovation intra firm and inter firms or the ways and modes for knowledge and technology transfers. What is the reason for technology changes in firms and regions or countries?

2. Theoretical background

During the analysis of quality in knowledge and technology transfer, which has been made in research institutions and universities in EU, there has been identified one of the main success factors. It was the complex, integrated attitude of the university (its bodies, officials, employees) to a knowledge, experiences and know-how transfer into the practice usage. This situation accrues from external pressure (evident within the whole EU), but it is also formed inside the universities and research institutions as a result of opinion that knowledge and technologies transfer bears not only the financial sources, but also incorporeal goods.
Knowledge and technology transfer produces an intensive contact and communication with user and creates the feedback for educational and research process. It promotes the competitiveness and employability in region. Managers and officials at the university should adopt this attitude and learn these positive thoughts in knowledge transfer. However, connection conceived in this way has some critical points:

- Not all of the universities and research institutions have a possibility to cooperate in the same intensive way with enterprises. There is a misunderstanding that only the technically oriented faculties are able to transfer the knowledge. E.g. cooperation between pedagogical and philosophical faculties and the practice could lead to intensification in life-long education and to development of knowledge economy.

- Culture and cognitive transfer process is a long-term matter and asks for new qualitative changes. Reorientation towards the practice brings out a negative employees’ reaction (fear from new tasks, need of further education, disability to cope with changes).

In Slovak Republic, until now, there have been realized more projects, which try to resolve the question about how to get through the scientific, research and educational university environment and the practice environment. Neither of model solutions, elaborated in foreign, high-developed economies, effectively fixes the problem in Slovakia.

Nowadays, there is a great part of Slovak production, generated by foreign investors, but they utilize the domestic research findings in minimal way. We insist the greatest accent on analysis of individual forms of interconnection between university and entrepreneurial environment, because in knowledge economy, they are the subjects who generate, disseminate and adapt new technologies and knowledge.

Economic theories present diffusion models for example epidemic, learning etc. that discuss inter firm diffusion processes but the attention to intra firm diffusion is related with the empiric studies (Arvanitis a Hollenstein (2001)\(^1\), Astebro (2004)\(^2\), Battisti a Stonemann (2005\(^3\), 2007)\(^4\), Hollenstein (2004)\(^5\)). Special attention is de-

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2. ASTEBRO, T. 2004. Sunk Cost and the Depth and Probability of Technology Adoption. Journal of Industrial Economics 52, s. 381-399
voted to empiric studies connected with diffusion of ICT\(^6\) or electronic communication services like e-business, IP, EDI, e-commerce\(^7\), e-purchasing and e-selling.

3. Case study

The University of Žilina is a public university that was founded in 1953 as Railway Transport College in Prague. Czechoslovak higher education in transportation and communication technologies has been transferred from Prague to Žilina in years 1959 – 1962 and developed in college named as Transport College. At present the University has links with many universities abroad. The University of Žilina\' professors, research workers and students participate in international educational and research projects in co-operation with partners abroad. After Czechoslovak separation the university in Žilina has cultivated its traditional orientation to all fields of transport and communications, electrical engineering, mechanical engineering, civil engineering and related technical and economic disciplines in the measures of Slovak Republic. Enlarging the profile of the University with information and communication technologies and automatic management was a natural consequence of the increasing role of new technologies in all social branches. The establishment of the Faculty of Science suggested the tendency of the University of Žilina towards more universal character of education, including arts, humanities and social sciences.

University of Žilina plays an important role in the Žilina region by its services for region. It cooperates with government in frame different projects, provides its facilities and resources for building successful region and takes part a lot of activities of the Žilina region. University is active player in the regional innovation policy formulation, in new clusters and in the knowledge and technology transfer processes.

For the transferring processes new institutional structures at the University of Žilina are creating or the University of Žilina as a partner is entering to new units, which weren‘t usual in Slovakia - as the science-technology park, Central European Institute of Technology are. Institutionalization in Slovak university condition can be realized by various forms. It support knowledge and technology transfer by the way of:

- creating the industry liaison office
- creating various innovation centers and productivity centers

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● creating common research – development offices between University and enterprises
● creating associations for solving concrete problems
● science-technology parks etc.

Projects of knowledge and technology transfer between employers and universities could be based on known methods of project management, on aim, organization, management determination, on project dividing, plan and control. The project management using in transfer processes includes definition of requirements and needs of transfer and the answers on the main questions: why? what? how? who? where? how much?

Transfer process can have more faces but it has to include:
– institutions – stakeholders, public administration, units in or off the university or another academic institution
– business model – investor, business angels or market acceptance
– resources:
  o technology – new products, innovations, incremental or radical changes, life-cycle of technology and product etc.
  o finance – venture capital, public resources, grants etc.
  o human – academicians, scientists, developers, entrepreneurs. They are also drivers tacit knowledge
  o social and culture – networking and partnerships, main users

At the University of Žilina following institution are created in connection with transfer processes:
– common laboratories with the industrial partners
– Industrial Liaison Office (ILO) – the part of University of Žilina that aim is [6]:
  o to arrange technology and knowledge transfer, the main theme of single lines is depend on complete aims of the University in the sphere of microelectronics, telematics, mechatronics...
  o to arrange advisory, to elaborate special directions, recommendations, studies, audits etc...
  o to arrange special courses, seminars, trainings in co-operation with the Centre of distance education University of Žilina and its faculties
  o to create database with offers and demands both sides with the aim of effective connections between them
  o to create the connections on other offices for contacts with industry
Slovak productivity centre (SLCP) is non-profit and opened associations of legal subjects and its aim is initiation and develops national movement for raising productivity in Slovakia. Its activities are oriented on:

- creating well-known centre for new information dissemination and knowledge from the sphere of productivity and competition
- active participation of centre workers in enterprises activities in the sphere of sustainable development and raising competition
- starting the National program for raising productivity in all levels of economy and social life
- oriented all society to the permanent raising productivity and competitiveness with regard to environmental and social connections

IPA Slovakia - association for transfer technology support - was founded as a result of common initiative Fraunhofer Gesellschaft in Munich and University of Žilina. It brings new knowledge and experiences from productivity to the Slovak industry. Common aim is the development of firms and arrange the most modern methods, which bring them long time prosperity and competing ability in the world.

Science-technology park Žilina and the business incubator (STP) is professional organization for small and middle enterprises support in Žilina region. It works with the ideas of innovations, technology transfer, which will connect University of Žilina, research institutions and firms.

Institute of Competitiveness and Innovations was founded as an entity at the University of Žilina. Its mission contains support of development of the University of Žilina with introduction of technology, product and process innovations, research and development in the High-Tech field, transfer of new technologies, knowledge and innovations into industry, research and analysis of factors influencing competitiveness of the Slovak industry, design of policies, methodologies, procedures and technologies for competitiveness improvement.

Flight Training Organization (FTO) – Air School of the University of Žilina that also is entity of the University of Žilina. The main activity of the FTO is to provide practical flight training and also air services.

Institute of High Mountain Biology. Main target of Institute is coordinating and developing biological science of alpine ecosystems in West Carpathian Mountains. Main part of studies is oriented on a impact of the climatic changes and pollution of atmosphere.

Cluster of ICT “z@ict” that main target is developing life quality for Žilina region citizens, increasing prosperity and attractively of region, as well as sup-
porting the competitiveness of institutions and firm in ICT in Žilina region. University of Žilina is one of the ten partners in the cluster.

– Centers of Excellence for example for systems and services of intelligent transport, for transportation engineering, experimental and clinic respiration, power electronic systems and materials for its components

Knowing the base facts of technology transfer success between academic and enterprises subjects is the first assumption on the way to success. Facts of success in knowledge and technology transfer:

● reasons and importance is clear and able to fulfill for all members,
● all aims of project must be define and limited and the same supplementary changes,
● chance for innovation and raising for collectives and individuals must be clear and understanding,
● aims of projects are dividing in time. In first phases are important safe and fast successes,
● there exist clear and understandable organization of project team,
● methods of project management is used,
● integrator of transfer take care about harmony and real high quality dialogue,
● start and phases of projects are clear signalized,
● about stadium of solving there are open, true and comprehensive reports,
● independent subject (ILO) keep the harmony of interests, not to became a hegemony in project, …

4. Conclusion

The way to the success in knowledge and technology transfer from academic sphere to enterprise and region surroundings is to understand and react in time on demands of firms, institutions, stakeholders and also to understand their way of thinking. Complex of knowledge, experiences, and results of development project must be given to enterprises in clear and understandable way. They must be focused on concrete aim and must be realized in practice. It is necessary to have new original point of view, new impulses and external stimulus. In Slovakia, research in this field could bring new impulses for such development as knowledge economy is. Universities have to play and to contribute to the regional development based on the knowledge. Indeed University of Žilina changes its structure, moves to the institution that is the place for knowledge creation, using and sharing with all stakeholders and builds its reputation by providing broad services for regional authorities and communities.
Literature

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